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ARTIFICIAL WOMB TECHNOLOGY AND THE ETHICS OF PRENATAL MEDICINE

Introduction

Current developments in artificial womb technology have rekindled the **expectation that human ectogenesis** may come within reach.

- After hysterotomy, extremely premature lamb fetuses have been transferred to an ex vivo uterine environment, demonstrating normal development and survival (Partridge 2017; Usuda et al. 2019).
- This offers proof of principle for partial ectogenesis: i.e. transfer of a partially developed embryo or fetus to an artificial womb for further development.

Expected applications of human ectogenesis:

- Improve neonatal intensive care;
- Provide an alternative for surrogacy or uterus transplantation;
- Possibility to terminate pregnancy without ending the life of the fetus;
- Remedy gender inequity;
- Advance fetal therapy.**

Ectogenesis could facilitate **fetal therapy** by enabling prenatal treatment interventions outside the body of the pregnant person.

- This paper addresses the morally relevant connection between ectogenesis and the fetus as a potential beneficiary of treatment.
- Recognition of the fetus as a potential beneficiary of treatment comes with ethical questions about how responsibilities towards fetal interests should be balanced against the interests of the pregnant person.
- The study question of this paper, then, is **how artificial womb technology would affect the way that obligations towards the future child and obligations towards the expecting mother are balanced against each other.**

Background

Relational as well as technological factors shape expectations about pregnant women's responsibility for the health of their future child, and this might feed **into internal and external pressures to undergo interventions for fetal benefit.**

- This is closely connected to technological developments that provide **access to and information about the prenatal environment.**
- Ever more technologies are becoming available that enable identification of fetal abnormalities (e.g. prenatal ultrasound and prenatal genomic diagnosis) and that subsequently facilitate intervention (e.g. fetal surgery).

The relevance for ectogenesis lies in the fact that **artificial womb technology could become an important facilitator in this process.**

- Not only could ectogenesis facilitate the monitoring of fetal development, it could also provide easier access for prenatal interventions aimed at fetal treatment.
- Today, **in utero fetal treatment risks possible maternal side effects** such as surgical complications and a risk of rupturing the uterus (Ovaere et al. 2015).
- The belief that fetal treatment would be safer if it occurred inside an artificial womb could work as a catalyst for developing human ectogenesis.

Results: The ethics of ectogenesis aided fetal treatment

When it is said that partial ectogenesis could make fetal interventions easier by allowing the fetus to be treated outside the pregnant person's body, it is still of central importance to keep in mind that, as is the case for in utero fetal surgery, the **fetal transfer to an artificial womb will also require an invasive surgical intervention on the woman's body**, probably in the form of a Caesarean section.

- The assessment of the invasiveness of procedures like Caesarean sections is rather mixed. On the one hand, Caesareans come with known dangers. On the other hand, the increase of elective Caesareans (in the absence of medical indications) may create an image of Caesareans as minor interventions, which sometimes goes hand in hand with a certain minimization of the associated risks.
- It is worthwhile to consider the hypothesis **that a minimization of the invasiveness of Caesareans might reinforce pressures on pregnant persons** to undergo a surgical intervention to transfer the fetus to an artificial womb for the benefit of the fetus.

While a pregnant woman may have obligations of beneficence towards the fetus, she may nevertheless refuse medical interventions, not only because of the value of autonomy, but also because of the value of bodily integrity.

- Importantly, dominant guidelines in neonatal care often urge **directive counselling** to convince pregnant persons to undergo medical interventions **for the benefit of the fetus, if the fetus is viable** (Chervenak and McCullough 1997).
- It is of particular relevance in this respect that **fetuses that cannot be clinically sustained ex utero today may become viable fetuses once artificial womb technology becomes clinically available.**
- This might further reinforce pressures on pregnant women to undergo fetal removal when fetal therapy is advocated and **possibly open the door for routine directive counselling for fetal benefit** when ectogenesis-aided fetal treatment becomes possible.
- Directive recommendations for fetal benefit should **take into account autonomy-related interests of pregnant women** that could thus be undermined. For many pregnant women, the experience of gestating and carrying a fetus in the womb to birth is a central aspect of pregnancy.

Conclusion

- With the prospect of partial ectogenesis, its effect on fetal viability and the associated possibility of treating the fetus outside the female body, there might be an increased tension between a clinician's obligations towards the pregnant woman and his/her duties of beneficence towards the future child.
- It is concluded that, even if ectogenesis could make fetal therapy easier, one should remain sensitive to the fact that it would not circumvent the key ethical concerns that today accompany in utero fetal treatment and that it may even exacerbate potential conflicts between directive treatment recommendations and the pregnant woman's autonomous decision to the contrary.
- It is important to inquire whether actual clinical codes of practice are sufficiently fine-grained to provide ethical guidance to the future practice of prenatal medicine, taking proper account of the pregnant woman's autonomy.



CTV News footage of premature lamb developing in Biobag (Partridge et al. 2017).

Literature

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